NASA SBIR/STTR Technologies

H20.02-9529 - Plastic Melt Waste Compactor Flight Demonstrator Payload (PFDP)

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Identification and Significance of Innovation

The PMWC Flight Demonstrator Payload is a trash dewatering and volume reduction system using heat melt compaction to remove nearly 100% of water from trash while significantly reducing the volume. Recent advances have proven that ORBITEC's HEHO-PMWC is a viable technology for producing 16" square tiles for radiation protection.
ORBITEC proposes to enhance the current state-of-the-art and prototypes that demonstrate the ability in Earth gravity by developing a flight-ready payload for utilization and testing on the ISS.
Testing is required in microgravity environment that only the ISS can provide to assess the system performance and physics associated with processing the melt, extracting water from trash, handling the water in microgravity. To aid in the testing, ORBITEC will add its current technologies for sensing and processing any gaseous byproducts that may evolve during processing. Finally, the effectiveness of the radiation products could potentially also be tested on ISS.

Estimated TRL at beginning and end of contract: (Begin: 3 End: 4)

Technical Objectives and Work Plan

The objectives of the phase I effort are to define the necessary interface and performance requirements and to then validate them through systems analyses and design. Since a larger functional prototype has already been shown to operate as required, the focus for this SBIR are to take the technologies that have been proven (surface treatments, vacuum compressor, gas/liquid separation, tile fabrication) and to round out the support hardware by designing new features into the door to enhance the capability of the overall system.

To accomplish the primary objective of developing a comprehensive requirements package, the first step is to gather all requirements for the proposed payload, which includes requirements related to ISS integration, launch vehicle integration, performance requirements, and other stakeholder requirements such as materials and processes. Additional steps include creating a requirements package and conducting reviews with NASA to come to an agreement on the payload requirements.

With requirements, a preliminary design and safety package will be assembled. Both of these items will use lessons learned on the current work being done at ORBITEC and after implementing new advances into the entire payload design, the design and safety package will be reviewed with NASA prior to the completion of the Phase I effort.

NASA Applications

Primary application is for any long-duration human spaceflight mission, including microgravity and planetary surface operations. Besides the primary benefits, which include waste volume reduction and water recovery, secondary benefits include additional health benefits by completely encapsulating the final compacted waste product, ultimately deterring microbial elements from entering the breathable airstream, and the plastic tile byproduct can be used as an effective radiation barrier.

Non-NASA Applications

The addition of a system that reduces waste volume, recovers water, and creates a useful byproduct can be a boon for commercial aerospace companies, such as Bigelow Aerospace, trying to reduce overall mission costs.

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